

GRAPPLING ARM ASSEMBLY WITH LATCHING MEANS

This invention relates to an assembly mountable on a machine for grappling various objects such as tree trunks, branches, rocks and the like.

Background of the Invention

In the use of excavating machines typically equipped with a bucket which may be curled and uncurled to perform excavating operations, it often is desirable to grapple and move various articles such as tree trunks, branches, large rocks and the like without materially interrupting the excavating operation. For this purpose, there has been developed and widely used in the construction, mining, land clearing and other industries, an arm member, commonly referred to as a "thumb," which is mounted on the underside of the dipper stick of the machine and cooperable with the bucket to grapple objects. Such arm members are either permanently positioned on the underside of the dipper stick in an extended, operative position or displaceable between an operative position cooperative with the bucket or an inoperative position disposed adjacent and detachably secured to the underside of the dipper stick.

In the use of the type of arm member which is displaceable between operative and inoperative positions, it has been found that the construction and displacement of such arm members in the prior art requires an undue interruption of the excavating operation of the machine which results in a diminution of productivity. Accordingly, it is the principal object of this invention to provide an arm member mountable on the underside of the dipper stick of a machine which may be easily and quickly displaced between an extended, operative position cooperable with the bucket of the machine for grappling objects, and a retracted, inoperable position along

the underside of the dipper stick, so as not to unduly interrupt the excavating operation of the machine.

Summary of the Invention

The objects of the present invention are achieved by providing an assembly mountable on the dipper stick of a machine having an implement pivotally connected to the dipper stick and means operatively interconnecting the dipper stick and the implement for pivoting the implement relative to the dipper stick, generally consisting of an arm member mountable on the underside of the stick for pivotal movement relative to the dipper stick, means for pivoting the arm member between a retracted, inoperable position and an extended, operative position cooperable with the implement when the implement is pivoted relative to the dipper stick toward the implement to grapple objects between the implement and the arm member, and means for detachably latching the arm member in the inoperative position. Such latching means includes a first member mountable on one of the dipper stick and the arm member having at least one recess and a second member mountable on the other of the dipper stick and the arm member having a yieldably biased protuberance receivable in the recess when the arm member is in the inoperative position. Preferably, the pivoting means for the arm member comprises a fluid actuated cylinder assembly which is adapted to be received within the envelope of the arm member when the arm member is in the inoperative position, and the latching means includes a bracket mounted on the underside of the dipper stick having a pair of outwardly, yieldably biased protuberances, and surfaces on the arm member provided with recesses registrable with such protuberances when the arm member is in the inoperative position, whereby the protrusions snap-fit into the recesses to displaceably retain the arm member in the inoperative position.

Brief Description of the Drawings

Figure 1 is a side elevational view of the front end assembly of an excavating machine, embodying the present invention, illustrating an arm member thereof in an extended operative position;

Figure 2 is a view similar to the view shown in Figure 1, illustrating the arm member thereof in a retracted, inoperative position;

Figure 3 is an enlarged, fragmentary view of the arm member shown in Figures 1 and 2, shown approaching the retracted, inoperative position and illustrating the latching means therefor;

Figure 4 is an enlarged view of that portion of Figure 2 designated by the reference numeral 2;

Figure 5 is a cross-sectional view taken along line 5-5 in Figure 3;

Figure 6 is a cross-sectional view taken along line 6-6 in Figure 4;

Figure 7 is an enlarged, cross-sectional view taken along line 7-7 in Figure 3; and

Figure 8 is a partial view of the view shown in Figure 6 illustrating the retaining component of the latching mechanism in a depressed condition.

Detailed Description of the Preferred Embodiment of the Invention

Referring to Figures 1 and 2 of the drawings, there is illustrated the front end assembly 10 of an excavating machine, equipped with an arm assembly 11, embodying the present invention. The front end assembly includes a dipper stick 12 pivotally connected to the upper end of a boom 13 of the machine by means of a pivot pin 14, a bucket 15 pivotally connected to the free end of the dipper stick by means of a pin 16 and an actuating assembly 17. The actuating

assembly includes a pair of support links 18, 18 pivotally connected at the lower ends thereof to the side walls of the dipper by means of a pair of pins 19, 19, a pair of actuating links 20, 20 pivotally connected at one set of ends to support links 18 by means of a pin 21, and pivotally connected at the other set of ends thereof to brackets mounted on bucket 15 by means of a set of pins 22, 22, and a fluid actuated cylinder assembly including a cylinder member 23 pivotally connected to a pair of brackets 24, 24 mounted on the upper side of the dipper stick by means of a pin 25 and a rod member 26 pivotally connected to pin 21. It will be appreciated that upon extension and retraction of rod member 26, bucket 50 will be caused to curl and uncurl in the conventional manner to operate the machine in a conventional excavating operation.

Arm assembly 11 includes an arm member 30, a fluid actuated cylinder 31 and a latching mechanism 32. The arm member consists of a pair of transversely spaced, elongated plate members 33 and 34 joined together adjacent one set of ends by means of a cross plate member 35 and at another end thereof by a cross plate member 36, and pivotally connected at the first mention end thereof to a bracket 37 mounted on the underside of the dipper stick adjacent the free end thereof, by means of a pivot pin 38. Cross plate member 36 is adapted to engage the cutting edge 39 of bucket 15 when the bucket is curled to the position as shown in Figure 1 and arm member 30 is in its extended, operative position also as shown in Figure 1. Plate members 33 and 34 also are provided with jagged edge configurations adjacent the free ends thereof for positively engaging an object gripped between the arm member and the bucket during a grappling operation.

Actuating assembly 31 includes a cylinder member 40 pivotally connected at the base end thereof to a bracket 41 mounted on the underside of the dipper stick by means of a pin 42, and a rod member 43 connected to a set of brackets 44 mounted on crosspiece member 35,

between plate members 33 and 34, by means of a connecting pin 45. Upon extension and retraction of rod member 43 in the conventional manner, arm member 30 may be extended to its operable position as shown in Figure 1 to cooperate with bucket 15 in the curled position to grip objects therebetween, and retracted to its inoperative position along the underside of the dipper stick as shown in Figure 2, to permit the bucket to be curled and uncurled in performing excavating operations. When the arm member is in its inoperative position along the underside of the dipper stick, cylinder assembly 31 will be disposed within the envelope of the arm member, between plate members 33 and 34 to not only remove the cylinder assembly from the path of the bucket but at least partially shield it from objects that could be struck and cause damage thereto.

Latching mechanism 32 is illustrated in detail in Figures 3 through 8. It includes a first component 50 mounted on the underside of the dipper stick and a second, cooperating component mounted on the free end of the arm member. Latch component 50 includes a pair of brackets 52 and 53 mounted on the underside of the dipper stick rearwardly of bracket 41 and a transversely disposed latching element 54 supported on such brackets. As best illustrated in Figure 7 each end of latching element 54 is provided with a recess 55 having an annular wall in which there is housed a coil spring 56. Each spring seats on a bottom circular wall of a recess and engages a button 57 at the opposite end thereof to yieldingly bias the button outwardly as shown in Figure 7. Each button includes an annular flange portion 57a and a convex or round portion 57b. Spring 55 bears against the element 57a and urges the convex portion through an opening in an annular element 58 rigidly mounted on an end portion of latching element 54. In the fully extended position under the biasing action of spring 57a, convex portion 57b of each

button projects beyond the outer surface of retainer element 58 and is restrained by engagement of the annular flange portion 57a engaging the inner surface of retainer element 58.

Referring to Figures 5 and 6, a pair of opposed annular elements 60 and 61 are rigidly secured to the inner sides of plate members 33 and 34 of the arm member. Such annular elements are disposed coaxially and are pivotal in planes about the axis of connecting pin 38, intersecting the convex portions 57 of latch elements 57. As the arm member is angularly displaced from the extended, operative position as shown in Figure 1 to the retracted, inoperative position shown in Figure 2, elements 60 and 61 engage and cam the convex portions of buttons 57, causing such buttons to displace inwardly against the biasing action of the springs and thus permit such buttons to register with the openings in elements 60 and 61 to further permit the buttons to displace outwardly under the biasing action of the springs and thus cause the arm member to snap-fit onto latching element 50 in the retracted, inoperative position. When it is desired to extend the arm member, cylinder assembly 31 is simply operated to angularly displace the arm member and correspondingly cause annular elements 60 and 61 to cam buttons 57 inwardly against the biasing action of the spring to release the arm member from its retracted, inoperative position.

Under normal excavating operations, the arm member will be retained in the retracted, inoperative position along the underside of the dipper stick as shown in Figure 2 with the latching components engaged as shown in Figure 6. Under such conditions, the boom, dipper stick and bucket may be operated in the conventional manner to provide an excavating operation. With the arm member positioned along the underside of the dipper stick and cylinder assembly 31 nested within the envelope of the arm member, the bucket is free to curl and uncurl as it travels through its excavating cycle, and cylinder assembly 31 is protected from striking any

object and thus becoming damaged. When it is desired to temporarily interrupt the excavating operation to remove an object such as a tree trunk, branches or a large rock, the cylinder assembly 31 is operated to move the arm member from the retracted, inoperative position shown in Figure 2 to the extended, operative position shown in Figure 1. The cylinder assembly for the bucket may then be operated to curl the bucket and thus grapple the object sought to be removed. As cylinder assembly 31 is operated to angularly displace the arm member, such action will cause annular elements 60 and 61 to cam buttons 57 inwardly against the biasing action of their associated springs to free the arm member and permit it to be displaced to its operative position for grappling an item to be removed. After the particular object has been removed and it is desired to resume the excavating operation, the operator need only operate cylinder assembly 31 to retract the arm member and permit it to be relatched against the underside of the dipper stick. As the arm member is thus angularly displaced toward the underside of the dipper stick, elements 60 and 61 will again trip buttons 57 to register the openings therein with the buttons which once more will be urged outwardly into such openings to again retain the arm member in its retracted, inoperative position. As the arm member is thus retracted, cylinder assembly 31 will be received within the arm member to again protect it from striking any object and becoming damaged.

Because the arm assembly of the present invention may be displaced between inoperative and operative positions easily and quickly without having to interrupt the operation of the machine and manually or otherwise manipulate such assembly, the productivity of the machine is not materially adversely affected. Furthermore, the simplicity of the construction and operation of the latching mechanism minimizes the cost of manufacturing, assembling and operating the assembly.

From the foregoing detailed description it will be evident that there are a number of changes, adaptations, and modifications of the present invention which come within the province of those persons having ordinary skill in the art to which the aforementioned invention pertains. However, it is intended that all such variations not departing from the spirit of the invention be considered as within the scope thereof as limited solely by the appended claims.